BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 1.12

PRODUCTION PROCESS STANDARD

Use of Rivet Squeezers (Portable and Stationary)

Issue 6
- This standard supersedes PPS 1.12, Issue 5.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the set-up and operation of both portable and stationary rivet squeezers.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

1.2 Refer to PPS 1.04 or PPS 1.05 for dimpling operations using rivet squeezers.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 PPS 1.04 - Modified Radius Dimpling Equipment.

3.2 PPS 1.05 - Ram Coin Dimpling Equipment.

3.3 PPS 13.26 - General Subcontractor Provisions.

4 Materials and Equipment

4.1 Materials

4.1.1 Riveting tape (e.g., 3M Company #685, 3/4" width).

4.2 Equipment

4.2.1 "C" type squeeze riveters and squeeze yokes (e.g., TS.412.04.11, TS.412.04.13 or TS.412.04.16).

4.2.2 Stationary riveter (e.g., CP450).

4.2.3 Alligator squeeze riveters (e.g., as specified in Table 1).

4.2.4 Rivet sets for portable rivet squeezers (e.g., as specified in Table 2, Table 3 and Table 4).

4.2.5 Rivet sets for a CP450 stationary rivet squeezer (e.g., as specified in Table 5, Table 7 and Table 8).

4.2.6 Spacer shims (e.g., as specified in Table 6).

5 Procedure

5.1 General

5.1.1 Rivet squeezers require only one operator and may be used to install solid rivets faster and more uniformly than the rivet gun method. Although the use of rivet squeezers is limited to structural accessibility (restricted by jaw opening and throat depth), they should be used wherever possible.

5.1.2 Three types of rivet squeezers are available, stationary and the portable “C” type yoke and alligator type. The suitability of each type of rivet squeezer is determined by its capacity (power) and its accessibility (jaw opening and throat depth).

5.1.3 It is acceptable to use alternative tooling to that specified in section 4.2, provided that all the requirements of this and the applicable rivet installation PPS are met.

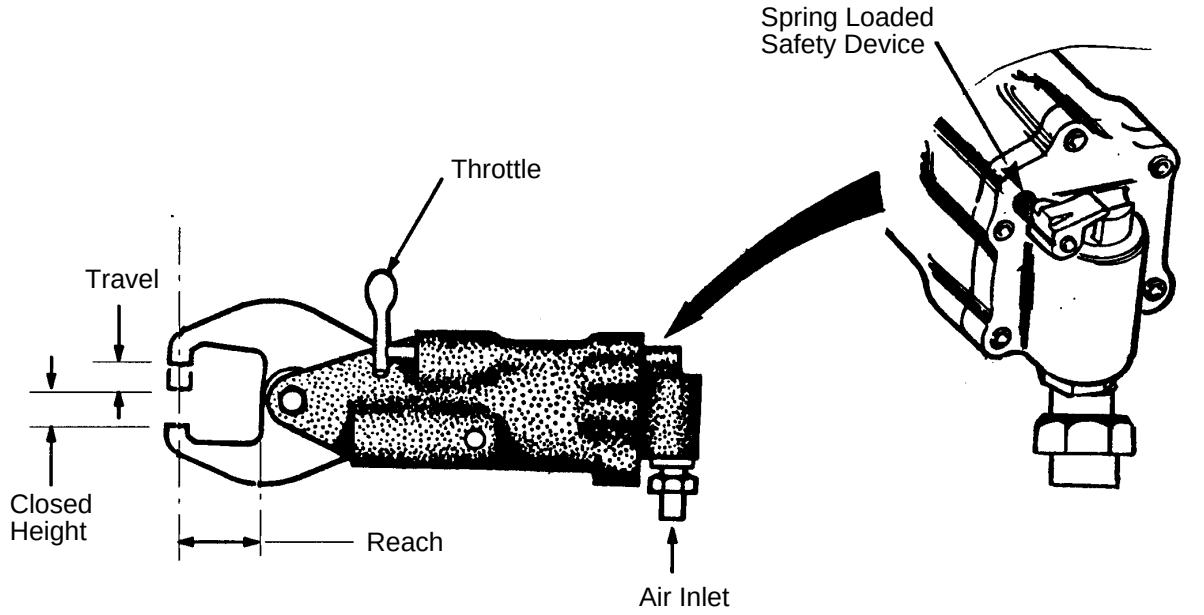
5.2 Portable Rivet Squeezers

5.2.1 There are two types of portable rivet squeezers, “C” type yoke and alligator type. Alligator squeezers are of two types, model CP214 P which has small jaws and model CP351 which has large jaws (see Figure 1). The yokes of the “C” type rivet squeezers are interchangeable and may be changed as required (see Figure 2).

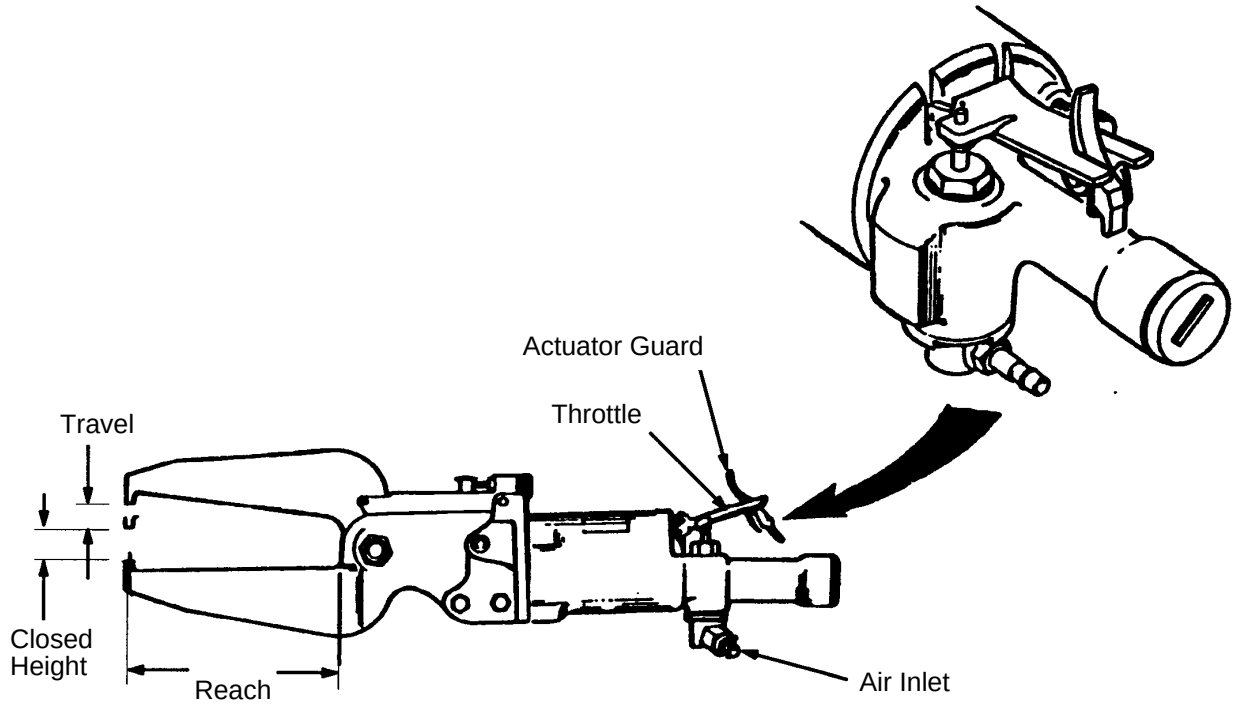
5.2.2 Rivet upset (i.e., rivet shop head) is controlled by the distance between the rivet set faces at full stroke. Since the stroke (i.e. closed height) of the squeezer is fixed (see Figure 3), the distance between the rivet set faces can be adjusted to allow for various rivet lengths, by selecting different length rivet sets; for additional adjustments, using spacer shims (see Figure 4 and Table 6).

5.2.3 Use portable squeezers with tandem cylinders when greater pressure is required to squeeze the rivet.

5.2.4 Before operating portable rivet squeezers, ensure that safety guard attachments have been installed to prevent any accidental actuation of the trigger.



Model 214 P



Model CP351

Figure 1 - Alligator Rivet Squeezers

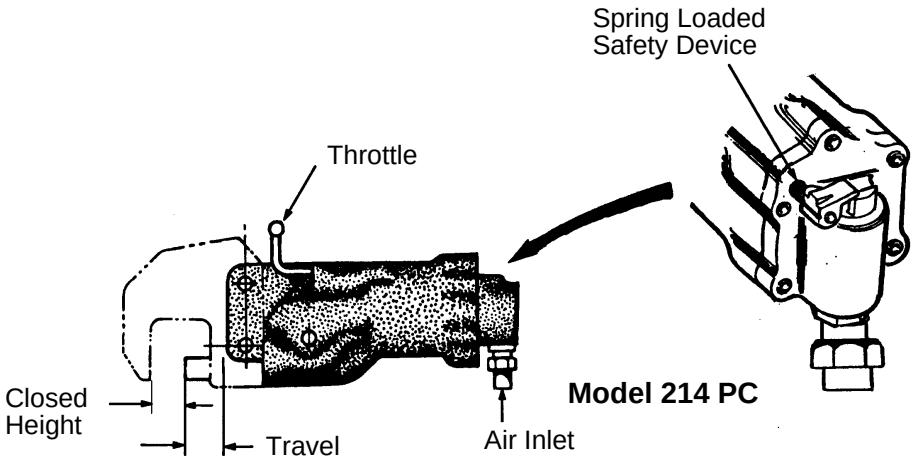


Figure 2 - "C" Type Rivet Squeezer

5.2.5 If required, to hold parts together and prevent any gapping condition between the sheets during forming of the shop head, use one of the following methods:

- After inserting the rivet in the hole and before squeezing the rivet, place a TS.411.10.13 riveting compression grommet over the shank of the rivet. Remove the riveting compression grommet after forming the shop head.

OR

- Use a pressure pad rivet set as specified in Table 5, if available.

5.2.6 Set-up and operate portable rivet squeezers as follows:

Step 1. Select a suitable rivet squeezer, either alligator or "C" type, to perform the required operation.

Step 2. Select the applicable rivet sets according to Table 2, 3 or 4, for the diameter of rivet and style of manufactured rivet head to be installed. When squeeze riveting universal or modified universal head rivets, use one cupped rivet set on the universal head (see Table 2) or modified universal head (see Table 3) and one flush (flat) rivet set (see Table 4 or Table 5) on the shop formed head. When squeeze riveting flush head rivets, use a pair of flush (flat) rivet sets. The total length of the bodies of the two rivet sets (B1 + B2) should equal the closed height dimension of the yoke (C) minus the total thickness of the material being riveted (M) and the height of the finished rivet head driven by the flush set (H) (see Figure 3).

Step 3. Select the length of the rivet set required to produce the correct shop head from Table 4 or 5, as required. If required, shim rivet sets to produce correct shop formed heads (see Table 6 & Figure 4). As a general rule, the length of the undriven rivet shall be one and a quarter to one and a half times the shank diameter (i.e., 1.25D - 1.5D) plus the thickness of the material in which the rivet is to be installed.

Step 4. Insert the rivet set which supports the manufactured rivet head into the fixed jaw of the alligator rivet squeezer or into the far side of the “C” type squeeze riveter.

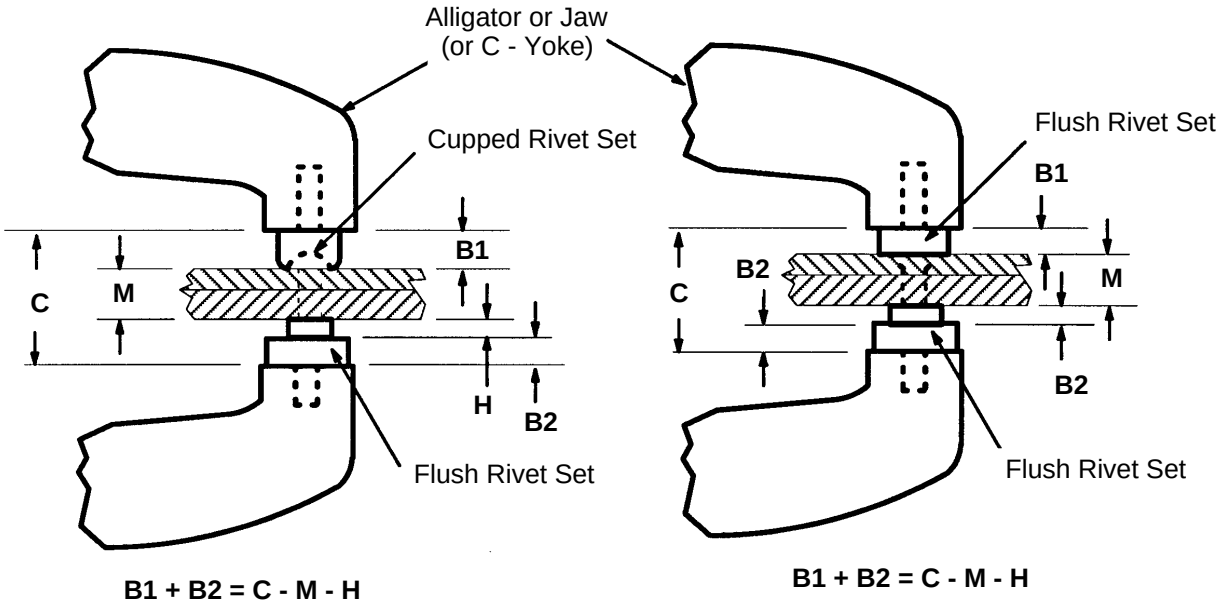


Figure 3 - Rivet Set Length Selection

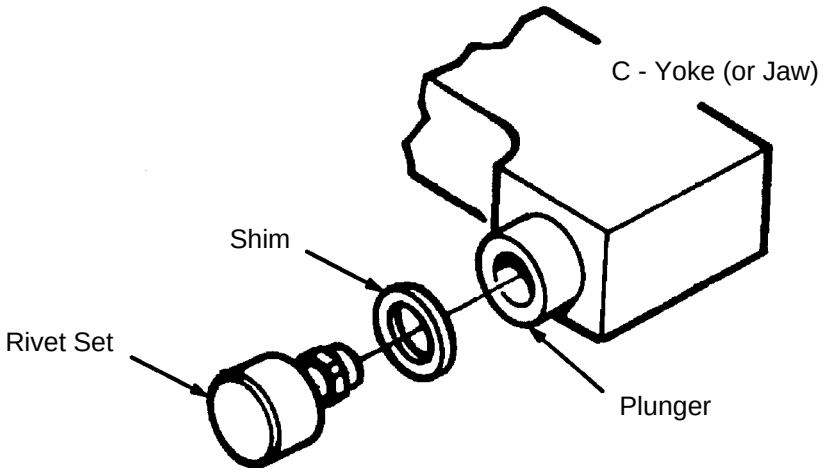


Figure 4 - Rivet Set and Shim

Step 5. Insert the appropriate flush rivet set into the moving jaw of the alligator squeeze riveter or into the plunger of the “C” type squeeze riveter. Take care to ensure that rivet sets are firmly seated in the jaws or yoke of the riveter. Ensure that the appropriate rivet sets are held firmly and squarely on the rivet head so that the axis through the rivet is 90° to the surface to be riveted.

Step 6. Connect the air supply to the swivel air inlet of the squeeze riveter.

Step 7. To actuate the CP214 squeeze riveter, move the throttle axially forward and press. The throttle is spring loaded to act as a safety device and will not actuate if pressed without moving the throttle axially forward. To actuate the CP351 squeeze riveter, release the actuator guard and press the throttle. The actuator guard acts as a safety device and prevents any accidental actuation of the squeeze riveter. Control the plunger speed by gradual pressure on the throttle.

Step 8. Squeeze rivet the work piece starting at the centre and working outwards in all directions to the edges of the skin so that the tendency of the skin to stretch does not result in warping or oil canning.

5.3 CP450 Stationary Rivet Squeezer

5.3.1 The CP450 is an electrically controlled, air operated, compression riveter with adjustment for length, speed and pressure of the stroke.

5.3.2 When the riveter is properly set-up, the yoke deflection activates a micro-switch (pressure control knob) for precise control of the compression force used to form the rivet shop head.

5.3.3 The precise control of compression force makes it possible to run several rivet lengths without changing the set-up.

5.3.4 Set-up and operate the CP450 stationary rivet squeezer as follows:

Step 1. Select a suitable flush rivet set from Table 7.

Step 2. Insert and screw tight the selected flush (flat) rivet set, which forms the shop head, into the top anvil of the riveter.

Step 3. Hold the rivets against the work piece by using riveting tape. It is not acceptable to use masking tape in place of riveting tape as the adhesive in the masking tape may enter between the rivet head and the work piece.

Step 4. Select the required adapter from Table 8 and insert into lower anvil and hold firmly by tightening the lock adjustment (see Figure 5).

Step 5. The flush rivet set or the adapter may be inserted into either the lower or upper anvil, depending on the accessibility of the rivets to be squeezed.

Step 6. Select the appropriate rivet set from Table 8 and insert into the adapter.

Step 7. Use a cupped rivet set for universal head rivets and a flush rivet set for flush head rivets.

Step 8. If the CP450 stationary rivet squeezer is used to install rivets for anchor nuts, use an anchor nut rivet set as specified in Table 7.

Step 9. Adjust the return stroke of the plunger movement to the minimum necessary to allow the work material to be easily slipped between the rivet sets.

Step 10. Adjust the stroke of the plunger for the optimum position by turning the dolly adjustment at the bottom of the lower anvil. The correct setting of the stroke is indicated when the lower edge of the spring cover plate is half way between the two upper lines on the stroke indicator.

Step 11. Adjust the pressure on the rivet sets to form the correct shop head by setting the pressure control knob as required (see Figure 5). Once the pressure is set for one fastener diameter, it is possible to run rivets with different grip lengths without changing the set-up.

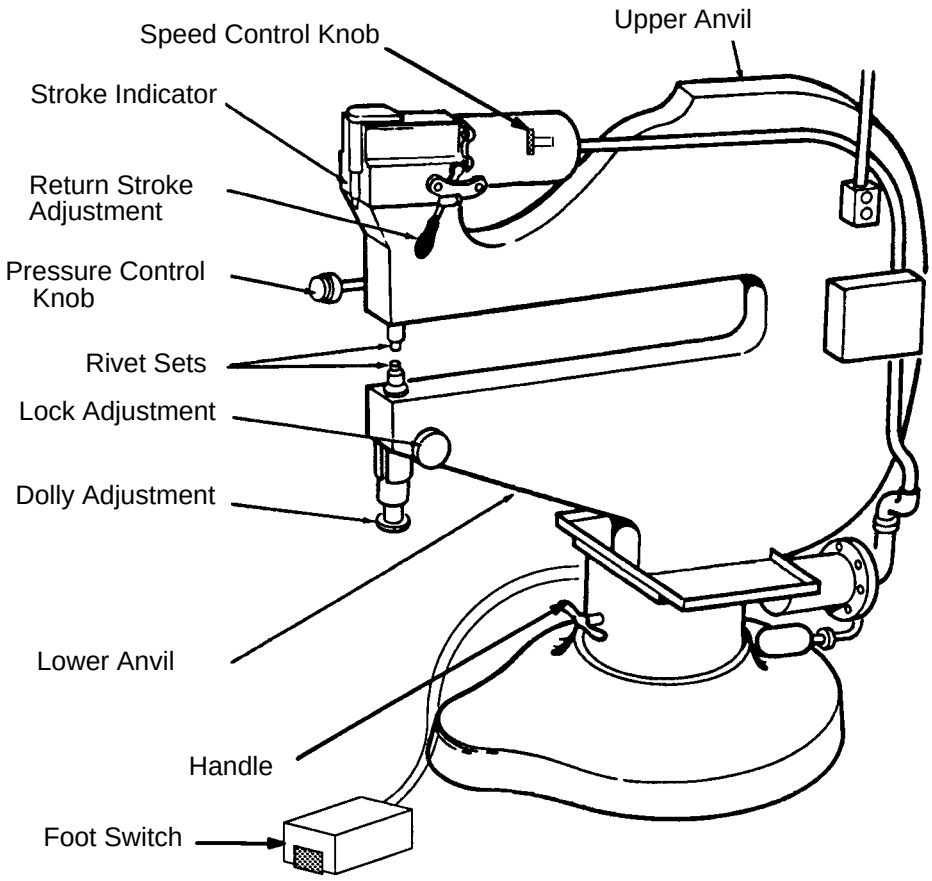


Figure 5 - CP450 Stationary Riveter

6 Requirements

6.1 Refer to the applicable fastener PPS for the height and diameter requirements for shop formed heads.

6.2 Refer to the applicable fastener PPS for the correct installation of rivets.

7 Safety Precautions

7.1 Observe general shop safety precautions when performing the procedure specified herein.

7.2 The air line shall be disconnected from the portable rivet squeezer when inserting or changing rivet sets.

7.3 Take care to keep fingers clear of the rivet sets while operating squeeze riveters.

7.4 Turn off the CP450 stationary riveter while installing or changing rivet sets or adapters.

8 Personnel Requirements

8.1 Personnel responsible for set-up and operation of squeeze riveters must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Maintenance of Equipment

9.1 Keep rivet squeezers clean and dry. It is recommended that every day a few drops of light machine oil be injected into the air inlet of pneumatic tools.

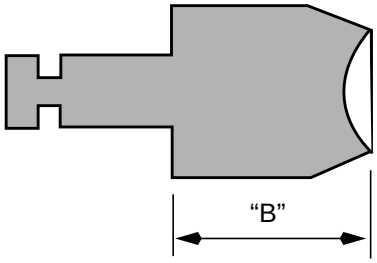
9.2 It is recommended that rivet squeezers be checked periodically and damaged or badly worn parts replaced.

9.3 Any alterations or rework of rivet squeezers or accessories must be appropriately approved.

Table 1 - Alligator Squeeze Riveters

MODEL	REACH	TRAVEL	CLOSED HEIGHT
CP 214	1.5"	0.62"	0.87"
	2.25"	0.87"	0.87"
	3.0"	1.25"	0.87"
CP 351	2.87"	0.62"	0.87"
	5.0"	1.37"	0.87"
	9.12"	1.68"	0.75"

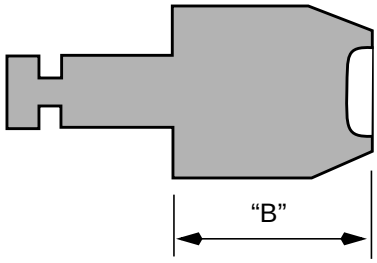
Table 2 - Universal/Protruding Head TS.412.50.12 Rivet Sets (Notes 1 & 2)



RIVET DIAMETER	RIVET SET LENGTH "B"				
	1/4"	**3/8"**	**1/2"**	**5/8"**	**3/4"**
1/16"	SM200-4702	SM201-4702	SM202-4702	---	---
3/32"	SM200-4703	SM201-4703	SM202-4703	SM203-4703	---
1/8"	SM200-4704	SM201-4704	SM202-4704	SM203-4704	SM204-4704
5/32"	SM200-4705	SM201-4705	SM202-4705	SM203-4705	SM204-4705
3/16"	SM200-4706	SM201-4706	SM202-4706	SM203-4706	SM204-4706
1/4"	SM200-4708	SM201-4708	SM202-4708	SM203-4708	SM204-4708

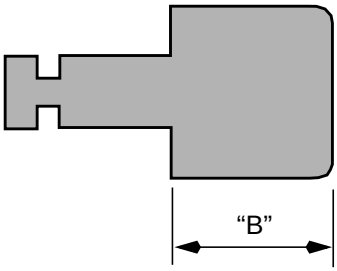
Note 1. Although a universal head rivet, install B0205011 rivets using a flat rivet set usually used with flush head rivets due to the head configuration.
Note 2. See also TS.412.60.13 Mk 1 for 1/8" diameter universal head rivets if a modified rivet set length of 0.15" is needed.

Table 3 - Modified Universal Head TS.323.13.14 Rivet Sets



RIVET DIAMETER	RIVET SET LENGTH "B"				
	1/4"	**3/8"**	**1/2"**	**5/8"**	**3/4"**
5/32"	MK 28	MK 29	MK 30	MK 31	MK 32
3/16"	MK 37	MK 38	MK 39	MK 40	MK 41
1/4"	MK 55	MK 56	MK 57	MK 58	MK 59

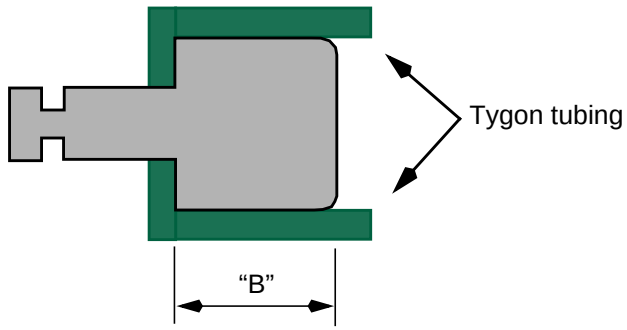
Table 4 - Flush Head TS.412.50.13 Rivet Sets



RIVET SET LENGTH "B"							
1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1.0"
SM210	SM211	SM212	SM213 (Note 1)	SM214	SM215	SM218	SM217

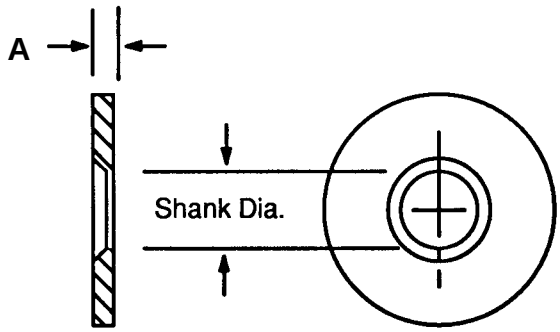
Note 1. Rivet set SM213 is also designated TS.412.60.12 Mk 1 and may be used for installation of Hi-Lok fasteners.

Table 5 - Flush Head TS.412.60.11 Pressure Pad Rivet Set



RIVET DIAMETER	RIVET SET LENGTH "B"							
	1/8"	**1/4"**	**3/8"**	**1/2"**	**5/8"**	**3/4"**	**7/8"**	**1.0"**
3/32"	MK 1	MK 2	MK 3	MK 4	MK 5	MK 6	MK 7	MK 8
1/8"	MK 9	MK 10	MK 11	MK 12	MK 13	MK 14	MK 15	MK 16
5/32"	MK 17	MK 18	MK 19	MK 20	MK 21	MK 22	MK 23	MK 24
7/16"	MK 25	MK 26	MK 27	MK 28	MK 29	MK 30	MK 31	MK 32

Table 6 - Spacer Shim Part Number

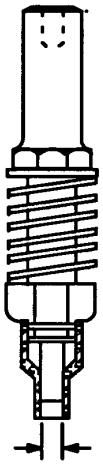


PART NO.	SM–S0	SM–S1	SM–S2
THICKNESS " A "	1/64	1/32	1/16
SHANK DIA.	3/16	3/16	3/16

Note: All dimensions in inches.

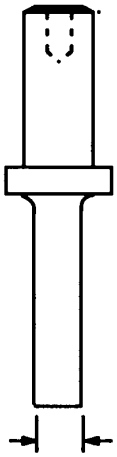
Table 7 - Rivet Sets for CP450 Riveter

SPRING LOADED FLUSH RIVET SETS



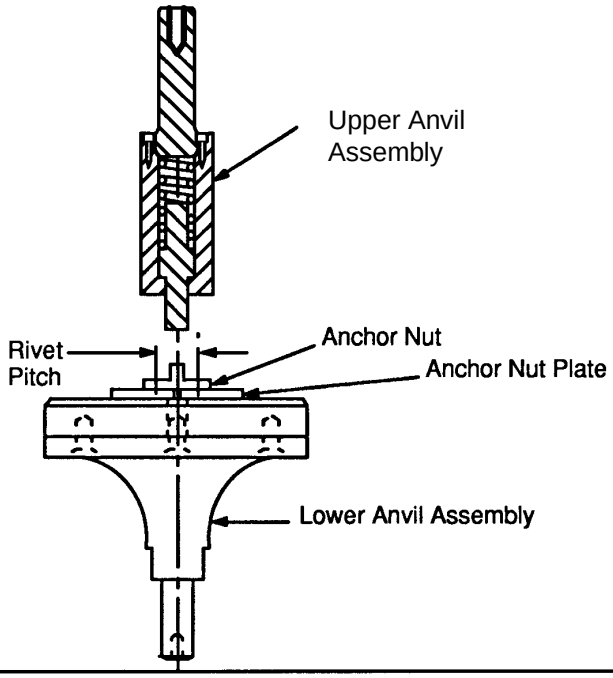
TOOL STANDARD NUMBER
TS.323.12.11 MK 24 (DIA. .375")
TS.323.12.11 MK 32 (DIA. .500")

FLUSH RIVET SETS



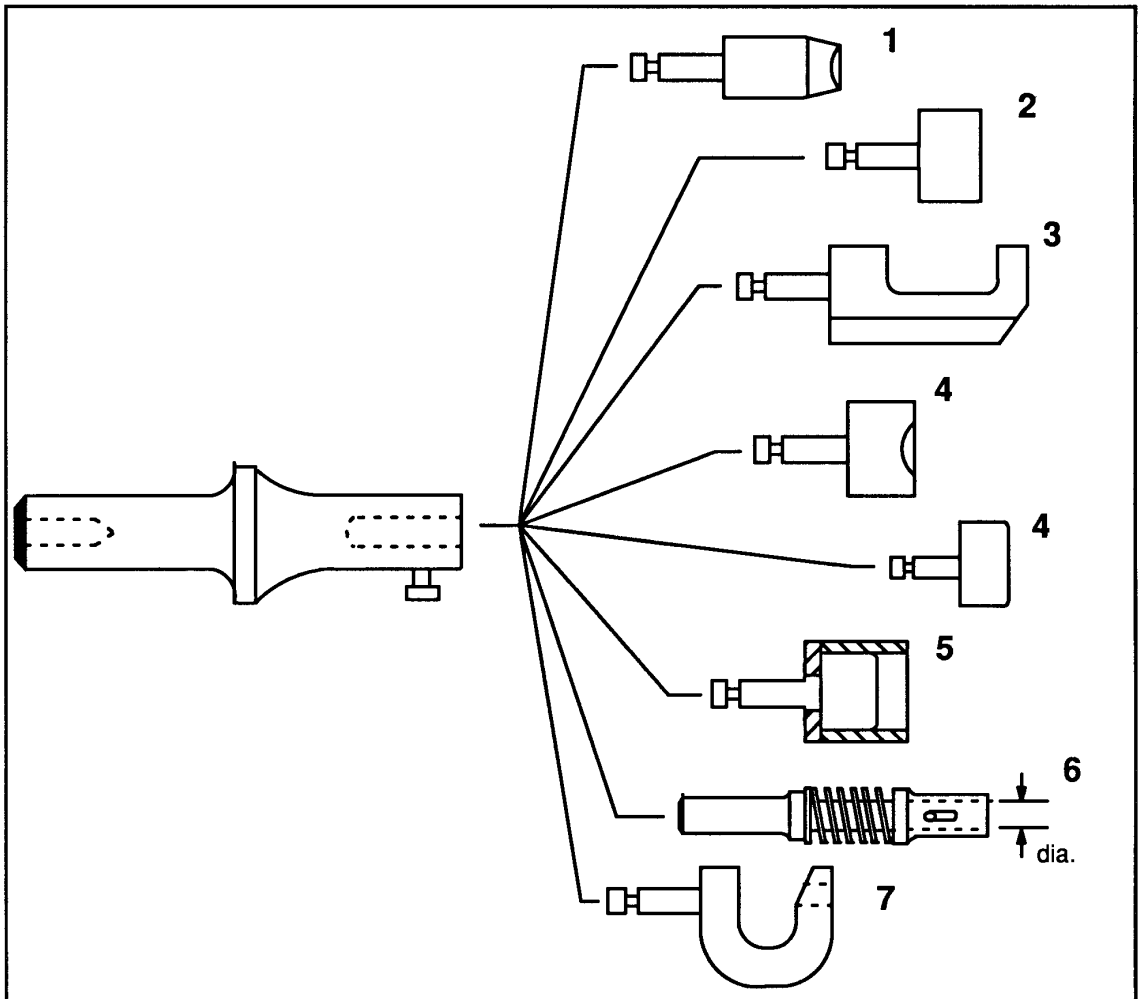
TOOL STANDARD NUMBER
TS.323.11.11 MK21 (DIA. .328")
TS.323.11.11 MK 39 (DIA. .484")
TS.323.11.11 MK 39 (DIA. .609")

ANCHOR NUT RIVET SETS



TS.323.14.11 MK 1 (Rivet pitch is .689")
TS.323.14.11 MK 2 (Rivet pitch is 1.00")

Table 8 - Rivet Sets and Adapters for CP450 Riveter



TOOL STANDARD NO. FOR ADAPTERS	TOOL STANDARD NO. FOR RIVET SETS	
TS.323.04.11 MK 12	1	TS.323.13.11 MK 1 (1/8 Rivet) – UNIVERSAL, TAPERED NOSE
	2	TS.323.13.12 – FLUSH, RECTANGULAR
	3	TS.323.13.13 – FLUSH, CUTAWAY
	4	ALL OTHER RIVET SETS AS PER TABLE III, IV & V
	5	RIVET SNAP PRESSURE PAD AS PER TABLE VI
TS.323.04.11 MK 20	6	TS.323.12.11 MK 5 (DIA. .312) – FLUSH, SPRING LOADED
		TS.323.12.11 MK 6 (DIA. .375) – FLUSH, SPRING LOADED
		TS.323. 12.11 MK 8 (DIA..500) – FLUSH, SPRING LOADED
	7	TS.323.13.17 – SPECIAL RIVET SET ADAPTER TO BE USED WITH RIVET SETS SPECIFIED IN TABLES III, IV & V

Note: All dimensions in inches.